REMARKS

INTRODUCTION:

In accordance with the foregoing, claims 1, 5, 8 and 13 have been amended. No new matter is being presented, and approval and entry are respectfully requested.

Claims 1, 4-5, 7-8, and 11-13 are pending and under consideration. Reconsideration is respectfully requested.

OBJECTIONS TO THE DRAWINGS:

In the Office Action, at page 2, the drawings were objected to. FIG. 9 has been amended to show the non-gapped core 71 more clearly in blow-up form, and a replacement FIG. 9 has been submitted herewith. Therefore, the outstanding drawing objections should be resolved.

Reconsideration and withdrawal of the outstanding objections to the drawings are respectfully requested.

REJECTION UNDER 35 U.S.C. §112:

A. In the Office Action, at pages 2-3, claims 1, 4-5, 7-8 and 11-13 were rejected under 35 U.S.C. §112, first paragraph, as failing to comply with the written description requirement. This rejection is traversed and reconsideration is requested.

FIG. 9 clearly shows non-gapped cores on the substrate plates. It is respectfully submitted that a non-gapped core is known to one skilled in the art. For further clarity, a blow-up of the core is also shown, and for even further clarity, the non-gapped core is labeled "NON-GAPPED CORE." The enlarged core configuration of a non-gapped core in amended FIG. 9 should clarify the type of core which is a "non-gapped core."

For further clarity, the paragraph on page 8, lines 1-7, has been amended to recite:

> Referring to ~~Fig~~FIG. 9, it is shown that the reproducibility and uniformity for a given permeability value are obtained when a temperature variation of less than one or two degrees is maintained. Special loading configurations have been developed for the annealing process so that the uniformity and reproducibility of the temperature in the oven are established. For a box type inert gas oven, wire mesh A1 plates 72 are stacked according to FIG. 9 and the arrangement is placed in the center of the oven. The A! plates 72 are substrates that hold the non-gapped cores 71 during the anneal process.

Thus, it is clear that the cores of the present invention are non-gapped.

The terminology "non-gapped" is known to those skilled in the art. For example, USPN 6,535,096, col. 6, lines 46 through 64, recites:

> The magnetic core 10 of FIG. 3 is based on an amorphous metal having a high magnetic induction, as is exhibited by iron-base alloys. The core 10 to be used may be of several forms, including single core-coil *or* pencil coil *arrangements*. Furthermore the core 10 may be either ***gapped*** or ***non-gapped***. A ***gapped*** core, shown in FIG. 4a, has a discontinuous magnetic section in a magnetically continuous path. One example of a ***gapped*** core 10 is a toroidal-shaped magnetic core having a small slit commonly known as an air-gap. The gapped configuration may be used when the permeability needed is considerably lower than the inherent permeability of the core material, as wound. The ***gapped*** form may also be used if the losses of an ***ungapped*** core with the required permeability would be excessive. The air-gap portion of the magnetic path reduces the overall permeability. A ***non-gapped*** core, shown in FIG. 4b, has a magnetic permeability similar to that of an air-gapped core, but is physically continuous, having a structure similar to that typically found in a toroidal magnetic core. (emphasis added)

Thus, FIG. 4, A and B, of USPN 6,535,096 are set forth below to demonstrate the distinction between gapped (see FIG. 4 A below) and non-gapped (see FIG. 4 B below) cores, as is known to those skilled in the art:

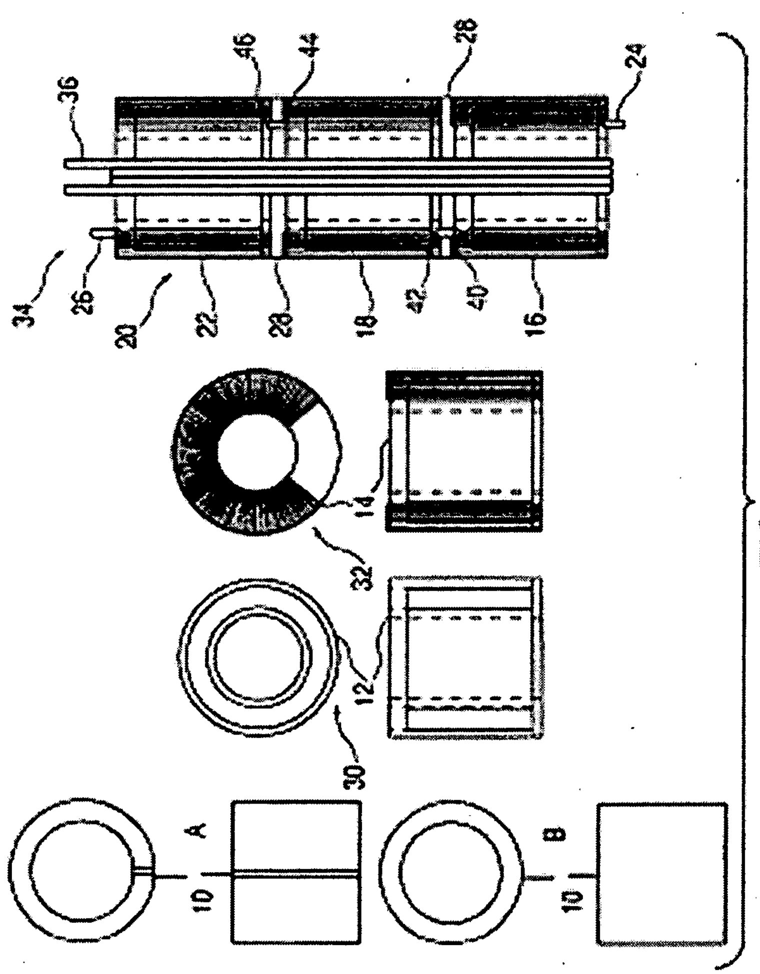

FIG. 4

Hence, it is respectfully submitted that claims 1, 4-5, 7-8 and 11-13 contain subject matter that is described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventors, at the time the application was filed, had possession of the claimed invention. Thus, claims 1, 4-5, 7-8 and 11-13 comply with the written description requirement under 35 U.S.C. §112, first paragraph.

B. In the Office Action, at page 3, claims 1, 4-5, 7-8 and 11-13 were rejected under 35 U.S.C. §112, first paragraph, as failing to comply with the enablement requirement. This rejection is traversed and reconsideration is requested.

The Examiner submits that the specification does not enable the inductor having a non-gapped core. The specification, page 8, lines 1-7, has been amended to clarify the core as a "non-gapped core" (see above), based on FIG. 9, in which element 71 has also been blown-up to show more clearly that the core is non-gapped.

As noted above, the terminology "non-gapped core" and "gapped core" are known to those skilled in the art. That is, a ***non-gapped*** core is physically continuous, having a structure similar to that typically found in a toroidal magnetic core.

Hence, the specification and claims, together with the figures, are submitted to comply with the enablement requirement, and claims 1, 4-5, 7-8 and 11-13 are submitted to be enabled under 35 U.S.C. §112, first paragraph.

C. In the Office Action, at pages 3-4, claims 1, 4-5, 7-8 and 11-13 were rejected under 35 U.S.C. §112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicants regard as the invention. This rejection is traversed and reconsideration is requested.

The Examiner suggested that claims 1, 5, 8, 12 and 13 should have the structure/arrangement of the non-gapped core of the inductor clarified with respect to the terminology "substantially."

Claims 1, 5 and 8 have been amended to recite, in part: "...substantially constant permeability to within 10% of the permeability at 1 kHz over a frequency range of about 1 to 1000 kHz," based on FIG. 4A. Thus, claims 1, 5 and 8 are submitted to be definite and to particularly point out and distinctly claim the subject matter which applicants regard as the invention under 35 U.S.C. §112, second paragraph.

Since claims 4, 7, and 11 depend from claims 1, 5, and 8, respectively, claims 4, 7 and 11 are submitted to be definite and to particularly point out and distinctly claim the subject matter which applicants regard as the invention under 35 U.S.C. §112, second paragraph for at least

the reasons claims 1, 5 and 8 are submitted to be definite and to particularly point out and distinctly claim the subject matter which applicants regard as the invention under 35 U.S.C. §112, second paragraph.

Claim 12 does not include the terminology "substantially." In view of the above description of "non-gapped core," it is respectfully submitted that claim 12 is definite and particularly points out and distinctly claims the subject matter which applicants regard as the invention under 35 U.S.C. §112, second paragraph.

Claim 13 has been amended to recite, in part: "...the permeability of the core is substantially constant to within 10% of the permeability at near zero field over a field strength range of approximately -15 to +15 Oersteds (Oe)." Thus, claim 13 is now submitted to be definite and particularly points out and distinctly claims the subject matter which applicants regard as the invention under 35 U.S.C. §112, second paragraph.

Thus, the terminology "substantially" has been clarified in the claims in which such terminology is utilized, and claims 1, 4-5, 7-8 and 11-13 are submitted to be definite and to particularly point out and distinctly claim the subject matter which applicants regard as the invention under 35 U.S.C. §112, second paragraph.

REJECTION UNDER 35 U.S.C. §103:

In the Office Action, at pages 4-5, claims 1, 4-5, 7-8 and 11-13 were rejected under 35 U.S.C. §103(a) as being unpatentable over applicants' admitted prior art ("AAPA") in view of Petzold (USPN WO 99/45643; hereafter, Petzold). The reasons for the rejection are set forth in the Office Action and therefore not repeated. The rejection is traversed and reconsideration is requested.

It is respectfully submitted that the Examiner admits that the AAPA does not disclose the specifics of the magnetic core. Applicants submit that the specific characteristics of the magnetic core of the present invention are significant. For example, in the Abstract of the present invention, it recites "Advantageously, the filter circuit provides as good or better performance than a filter circuit using a Co-base core; but is much less expensive. As such, it provides a low cost, high efficiency solution to communications applications, such as DSL communications systems, and the like" (emphasis added). Further, page 6, lines 1-11, of the specification recite:

> FIG. 3 is a graph depicting magnetization curves for an Fe-based amorphous alloy core according to the invention and a prior art core based on a Co-rich amorphous alloy. The graph indicates that the permeability defined by μ=B/H of the core of the present invention is substantially linear. The magnetic field strength H is varied over a range from about -40 Oe to +40 Oe causing a linear change in the corresponding magnetic flux density B over a range of about +13 to -13 kG. The linear permeability property makes the Fe-based core suitable as a

bandpass filter circuit in a DSL communication system. The permeability of the prior art core on the other hand is linear only up to the induction level of about 7 kG, which is substantially lower than the 13 kG level reached in the Fe-based core of the present invention. The larger available induction level of the core according to the present invention is desirable because the core can be operational with larger current levels in telecommunication lines. (emphasis added)

Hence, it is respectfully submitted that the specific characteristics of the non-gapped core of the present invention are different from characteristics of the cores of the prior art.

It appears that there may be some confusion regarding the difference between amorphous and nanocrystalline alloys and the difference between a bandpass filter (the present invention) and a noise filter (prior art). A noise filter increases a signal to noise ratio over a wide frequency range, whereas a bandpass filter lets the signal in a given frequency range pass through, reducing noises from outside the selected frequency range. Thus, in the selected frequency range, an overall signal to noise ratio is much higher in a bandpass filter than in a conventional noise filter.

A bandpass filter is an electronic device or circuit that allows signals between two specific frequencies to pass, but that discriminates against signals at other frequencies. That is, a bandpass filter is a filter that passes one band of frequency and rejects both higher and lower frequencies.

The following explanations are provided for clarification.

The Examiner's comment on page 4 states: "Petzold et al. discloses a filter comprising an inductor having a core that consists essentially of an Fe-base amorphous metal alloy ribbon and has a substantially constant permeability over a frequency range about 1 to 1000 kHz. Petzold et al. further discloses the core having a permeability in a range of 400 to 1000 over a frequency range of 1 to 1000 kHz [figure 5]. Petzold et al. disclose a linear B-H loop of the device [figure 3]."

Although Petzold discloses Fe-based amorphous alloys, no examples are given for such a case. In Table 2, column 11, US Patent No. 6,559,808 to Petzold et al.[hereinafter, Petzold '808], only two types of structures are mentioned, namely, amorphous and nanocrystalline. These amorphous alloys are all Co-based and not Fe-based. The nanocrystalline alloys are Fe-based but are not amorphous, as is set forth in the claims of the present invention. Fig. 4 of Petzold '808 shows permeability curves as a function of a DC field for only Co-based amorphous alloys and Fe-based nanocrystalline alloys. No data or curves are shown for Fe-based amorphous alloys in the entire Petzold '808 patent. For clarity, it is respectfully pointed out that a "nanocrystalline" material is not amorphous, but is crystalline with nanosize crystallites.

USPN 6,559,808 by Petzold et al. appears to correspond to Petzold et al. (WO 99/45643). In USPN 6,559,808, claim 1 recites:

1. Low-pass filter for a diplexer for separating low frequency signals of analog

communications systems from high frequency signals of digital communications systems, the low-pass filter comprising a plurality of longitudinal inductances connected in series, such longitudinal inductances (i) comprising magnetic cores made of an amorphous or nanocrystalline alloy, (ii) having impedance which increases with increasing frequency and suppresses harmonics of the low-frequency signals, and (iii) having a saturation induction B_s >0.6T, a saturation to remanence ratio B_r/B_s <0.2 and a permeability that is constant to a very large extent up to above 10 kHz. (emphasis added)

Hence, it is respectfully submitted that the invention of Petzold '808 sets forth a low-pass filter, in contrast to the present invention, which sets forth a bandpass filter.

In addition, as clearly indicated in Table 2 of Petzold (US 6,559,808 or WO99/45643), all of the Petzold Fe-based alloys are "nanocrystalline" and all of the Petzold Co-based alloys are "amorphous". As a matter of fact, the alloy $Fe_{73.5}Cu_1Nb_3Si_{15.5}B_7$ in Fig. 4 of Petzold '808 is a nanocrystalline alloy covered in the Yoshizawa et al. Patent (US Patent 4,881,989) relating to nanocrystalline alloys containing fine crystalline particles (and therefore not amorphous alloys). The difference between an amorphous and nanocrystalline alloy is thus well known to those skilled in the art. Based on these facts, an amorphous Fe-based alloy having a substantially constant permeability over a frequency range of about 1 to 1000 kHz is not obvious.

Fig. 5 of Petzold '808 shows permeability curves (real part as opposed to imaginary part) as a function of frequency for two alloys of permeabilities of about 900 and 40,000 at 0.01 MHz. It is respectfully submitted that there is no permeability (real part as denoted by μ_s' in Fig. 5 of Petzold '808) below ~ 900 for a frequency below 1 MHz, as the Examiner submits in his comment.

In general, magnetic materials have two kinds of energy loss at high frequencies: hysteresis loss due to damping in the magnetizing process and Ohmic loss due to eddy current. At even higher frequencies there can also be various resonance and energy absorption, which result in energy loss. These energy losses can cause changes in permeability (μ) as a function of frequency. Permeability is the ratio of magnetic induction (B) to the magnetic field (H) and can be split into a real and an imaginary part. The higher the permeability, the easier it becomes to conduct magnetic flux.

Hence, when a magnetic material is exposed to a rapidly varying field, the result is generally a loss of total energy from the core. In general, core loss should be minimized for maximizing energy efficiency. Core loss is defined as the power dissipated in the core as it is exposed to alternating magnetic fields; it can be expressed as the sum of hysteresis loss and eddy current loss. Hysteresis losses are brought about by the necessary expenditure of energy to overcome the retained magnetic forces within the iron-core component. The other component of core loss is known as eddy current loss. Eddy current losses are brought about by the production of electric currents in the iron-core component due to the changing flux caused by alternating current (AC) conditions. As total core loss is measured over a wide frequency range,

the contribution of each component of loss to the total core loss changes. Since hysteresis loss and eddy current loss are functions of frequency to the first and second power, respectively, hysteresis dominates the low frequency loss and eddy currents dominate the high frequency loss.

Hence, the permeability of a magnetic core is the characteristic that gives the core the ability to concentrate lines of magnetic flux. The core material, as well as the core geometry, affects the core's effective permeability. For a given core shape, size and material, and a given winding, higher permeability magnetic materials result in higher inductance values, as opposed to using lower permeability materials. The permeability of an Fe-material is a complex parameter consisting of a real and an imaginary part. The real component represents the reactive portion and the imaginary component represents the losses.

Fig. 3 of Petzold '808 shows a B-H curve for one alloy with a linear portion in the range of -6.5 to +6.5 A/cm. This field range translates to a range of -8 to +8 Oe as 1 Oe (in cgs unit) = 0.8 A/cm (in SI unit). As shown for an embodiment of the invention in FIG. 3, and as recited in claims 4, 7, 11 and 13, there is a linearity in the range of -15 to +15 Oe. This range is quite different from what is described in Petzold '808, and the Examiner's comment on page 5 ("Petzold et al. inherently discloses the substantially constant permeability exists for a field strength range approximately -15 to +15 Oe".) The extreme linearity fields in the present invention are <u>more than twice</u> the values described in Petzold '808.

Thus, a bandpass filter based on such an Fe-based amorphous alloy of the present invention is submitted to be patentable under 35 U.S.C. §103(a) over applicants' admitted prior art in view of Petzold (USPN WO 99/45643). Hence, independent claims 1, 5, 8, 12 and 13 of the present invention are submitted to be patentable under 35 U.S.C. §103(a) over applicants' admitted prior art in view of Petzold (USPN WO 99/45643). Since claims 4, 7, and 11 depend from claims 1, 5 and 8, respectively, claims 4, 7 and 11 are submitted to be patentable under 35 U.S.C. §103(a) over applicants' admitted prior art in view of Petzold (USPN WO 99/45643) for at least the reasons that claims 1, 5, and 8 are patentable under 35 U.S.C. §103(a) over applicants' admitted prior art in view of Petzold (USPN WO 99/45643).

CONCLUSION:

In accordance with the foregoing, it is respectfully submitted that all outstanding objections and rejections have been overcome and/or rendered moot, and further, that all pending claims patentably distinguish over the prior art. Thus, there being no further outstanding objections or rejections, the application is submitted as being in condition for allowance which action is earnestly solicited.

If the Examiner has any remaining issues to be addressed, it is believed that prosecution can be expedited by the Examiner contacting the undersigned attorney for a telephone interview to discuss resolution of such issues.

If there are any underpayments or overpayments of fees associated with the filing of this Amendment, please charge and/or credit the same to our Deposit Account No. 19-3935.

Respectfully submitted,

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IN THE DRAWINGS:

In the Office Action, on page 2, the Examiner objected to the drawings. In order to overcome these objections, a replacement figure for FIG. 9 is submitted herewith. In FIG. 9, a blow-up of element 71 is shown, to clarify that the core 71 is non-gapped. Approval of these changes to the Drawings is respectfully requested.